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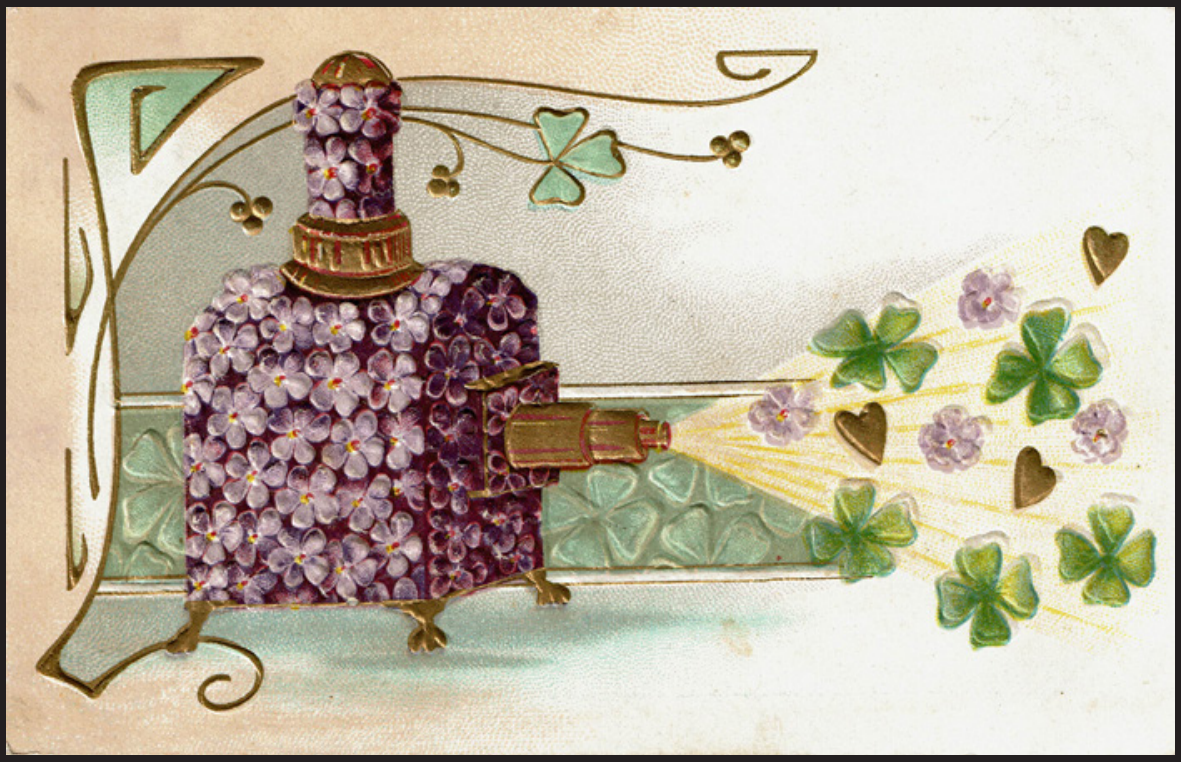

The Magic Lantern Society of
the United States and Canada

www.magiclanternsociety.org

In two articles that I wrote for *The Magic Lantern Gazette* in 2017, one on Dionysius Lardner and the other on the oxyhydrogen microscope, I mentioned that Lardner had an assistant named Robert Grant, who helped with projection and sometimes exhibited both a limelight magic lantern and an oxyhydrogen microscope on his own in the 1840s. I also found that he had a general interest in lighting techniques and methods for producing lighting gas, but beyond that, I did not find much to identify this man with a relatively common name.

After my article on Lardner was published, society member David McLean contacted me and said he had been researching Robert Grant for several years. The results of his research are presented in his article in this issue. It turns out that Grant had long career with the calcium light, another name for limelight, and its many possible uses. His article reminds us that the calcium light was used not only for projecting images, but also for interior and exterior lighting, theater lighting, illumination for ships and trains, and even lighting up fortifications during the Civil War. David also turned up an anonymous poem singing the praises of the calcium light, which is reproduced here.

This issue also contains a short Reseach Page section that summarizes recent academic research on the magic lantern and its broader cultural contexts, some published in fairly obscure journals. Some are in open-access journals, freely available online; others require a university library subscription or payment.

This issue is shorter than recent ones, but I used the opportunity to get the issue out in a timely manner so the season listed on the cover actually matches the season outdoors.

As usual, I am always in the market for new material on any aspect of magic lantern history and culture, in any country, at almost any length, and welcome articles with abundant illustrations.

Finally, a reminder that back issues are posted at http://library.sdsu.edu/scua/digital/resources/magic-lantern-pubs/gazette

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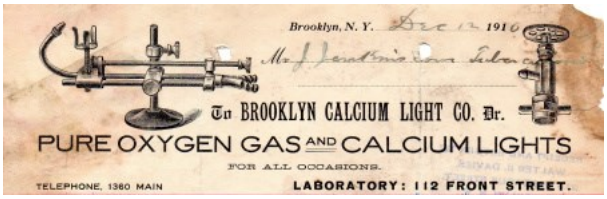
Love's New Light

Talk not about the gone romance
Of pale moon, evening star,
Soft beams upon the brook that dance,
And Phoebus with his car:
Those vaunted lights of olden time
Down to mere sparks have dwindled,
Since Chemistry from humble lime,
The Calcium has kindled.
Then come to me, thy hand unite
With mine, my blue-eyed flower;
We'll wander by the Calcium Light,
At fifty cents an hour!
II
No more beseech I thee, my love,
To meet me, when the Moon
Her pale disk shows the trees above-
I am not such a spoon.
All moons the Calcium doth outvie;
Within its beams we'll stray-
Beyond its watchful ray!
Then come thy timid hand entrust
To mine my blue-eyed flower;
The Calcium Light to love is just,
At fifty cents an hour!

Vanity Fair, October 5, 1861

(Transcribed by David McLean)


Brooklyn, N. Y.
To BROOKLYN CALCIUM LIGHT CO. Dr.
PURE OXYGEN GAS AND CALCIUM LIGHTS
FOR ALL OCCASIONS.
TELEPHONE, 1360 MAIN
LABORATORY: 112 FRONT STREET.

I have no idea what anyone would need pure oxygen gas and calcium lights for, but this DUMBO supplier says they're "for all occasions."

(https://ephemeralnewyork.wordpress.com/tag/brooklyn-calcium-light-company/)

Robert Grant and His Calcium Light

David McLean
5499 State Route 104
Oswego NY 13126
tinner1830@hotmail.com

Robert Grant (c. 1809/10-1868), a builder and displayer of calcium light (also known as Drummond light or limelight) in the middle of the 19th century, was introduced in recent articles in *The Magic Lantern Gazette* as a lecture partner with Dionysius Lardner, exhibiting magic lanterns, oxyhydrogen microscopes, and Drummond lighting.[1] This article ties Grant and the calcium light together and shows that he was well known for his lighting work in the United States from the 1830s through the 1860s.

Grant was born in Hancock County, possibly Ellsworth, Maine, in either 1809 or 1810. At some point, he became involved in railroad and gas lighting improvements and then with calcium lighting. It is unclear from available records how he got from Maine to Philadelphia and then Baltimore, where he lived when granted railroad car related patents in 1837 and 1838 respectively.[2] This is the background discussed in newspaper reports of Lardner's associate being " a man of science . . . [with] important improvements in railway engineering and in gas lighting. . . ."[3]

Robert Grant married a New York woman in 1839 and their first child, John M., was born in 1840, according to most records in Maine (Some records put his birth in Maryland, which makes more sense). It's possible that they went back to visit his family and were missed by the census takers while in transit, since they are not in the 1840 census. Grant's father was a merchant, and Ellsworth, Maine is near the coast on a navigable river, with mills and shipyards, so not in the backwoods where people could easily be missed by the census takers. In any case, by the summer of 1841, Grant was back in the Maryland area presenting a plan to the U. S. House of Representatives to light the building and streets with gas produced from tree bark.[4] In the House report he is referred to as Robert Grant of Maine, supporting the notion that his son was born there the previous year.

While gas from tree bark is not directly related to calcium lights, it indicates Grant's early interest in lighting, and will show up much later. The idea of using tree bark to produce hydrogen gas was developed as a cheaper, cleaner way of making gas than using coal. The bark was available as a waste product of the lumber industry and probably was inexpensive. Otherwise, lighting gas was still produced in a retort like coal gas, but with each building producing its own gas rather than being connected to a municipal system. The light fixtures were similar to those already in use. Although it was recommended, the tree-bark gas system was never installed. This seems to be the point at which Grant began working on calcium lighting, work that would last the rest of his life. In 1864, he said he had been in the calcium light business for twenty-four years, which would make it just right for 1840-41.

Grant's Lectures and Experiments in the 1840s

Robert Grant and Dionysius Lardner must have crossed paths at least by reputation during this time. Lardner began his lecture tour in New York City in late 1841 and by the spring of 1842 was in Baltimore, where Grant probably lived, as well as Washington and Alexandria, Virginia. Grant is known to have given lectures in Alexandria in November and December 1843 at the same hall Lardner used the previous year. Other likely evidence that they joined forces in the Washington area is that after those lectures, the demonstration of the Drummond light illuminating the entire lecture hall was added to the program. That was a particular project of Grant's.[5]

It not known how long Lardner and Grant toured together, but as noted, by December, 1843, Grant was lecturing in Alexandria and Lardner in Philadelphia. Lardner was in Washington in January, 1844 and continued south toward Charleston, South Carolina, while Grant lectured in Washington in March. Grant's program included the Drummond light, lighted dioramic paintings (magic lantern slides), and experiments with gas, including opportunites for members of the audience to breathe "exhilarating gas" (nitrous oxide or "laughing gas").[6]

That same month, Grant demonstrated his Drummond light to Congress. The Committee on Public Buildings and Grounds reported to the House of Representatives

on March 28, 1844. The light is described in some detail and is likely the same set-up shown in the lecture halls as it is called a "small experimental apparatus." The output of the light was enough that during demonstrations, the Capitol rotunda and then the hall of the House were completely lit (Fig. 1). The light consisted of a disk turned by clockwork with multiple limes and was claimed to operate for twelve hours. The report reads that "the light can be sustained, without diminution." There is no drawing, but the limes must have been close together so as to be preheated, turning into the flame and becoming incandescent before the previous lime went out. Instead of candle power, the light output was calculated as "equal to six hundred oil lights from the best argand burners." It was so bright that the fixtures had to be above eye level with ground glass shades. The cost of operation was projected to be three dollars per night, as opposed to twenty-five dollars to use the present oil lamps and candles. Even though the Committee resolved to contract with Grant, the House voted to reject the project.[7]

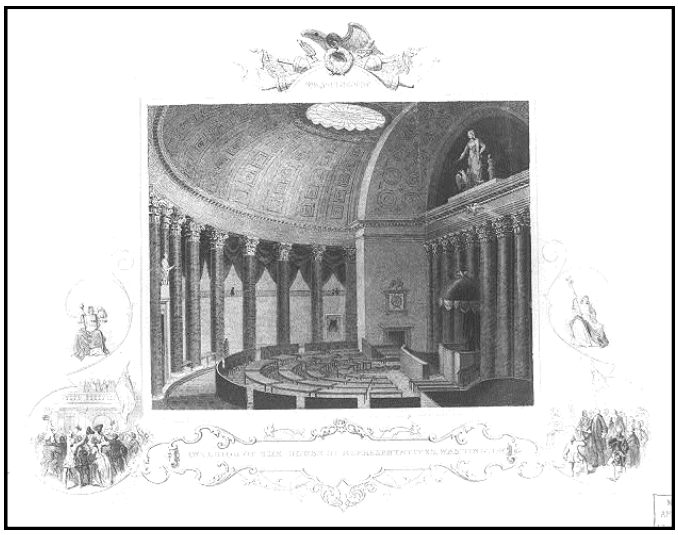


Fig. 1. Interior of the House of Representatives, Washington. Drawn by W. Goodacre, Jr., N.Y.; engraved & printed by Fenner Sears & Co. Published by I. T. Hinton, & Simpkin & Marshall, 1831. Library of Congress

In June, 1844 Lardner returned to Baltimore with the hall lit by Drummond light. Grant may have been there and gone on tour with him again, as the Boston lecture in October had Drummond light demonstrations. Grant was definitely lecturing in Washington on chemistry and mechanical philosophy in November 1844.[8] Lardner had lost his exhibition materials in a fire in Rhode Island in October and headed back to Europe by June, 1845. Grant continued experiments and probably lectures, and by the summer of 1846, he had a new light to show.

The Daily Union, a Washington newspaper, dated July 22, 1846 had an announcement of Robert Grant's "new arrangement of the oxy-hydrogen light." This light was to be stationed outside the Capitol and would illuminate the "President's house" a mile away. The beam direction was movable and Grant wished for the military Secretaries and Congress to observe and consider its use for night attacks. This is the beginning of what would become Grant's contribution to the Civil War many years later. There is no evidence that anyone in the government even observed the test, much less pursued a contract for purchase.[9]

While Grant was pushing various uses of his lighting, he also continued experiments in other gas projects. It is unclear how Grant supported his family. Although I found no other lecture advertisements, it can be assumed he carried on with that at least in the local area. *The Richmond Enquirer* newspaper on October 1, 1847 reported an incident at the Norfolk Naval base where he is called Professor Grant, which suggests he was speaking in public. A Navy ship, the frigate *Raritan*, had come into Norfolk from participating in the Mexican War, its crew sick and dying from yellow fever. It was anchored offshore for months, with sixty thousand dollars of powder and supplies loaded and everyone afraid to go aboard. Professor Grant convinced the Navy to let him disinfect the ship with a gas he invented. He spent a week on board alone and then the ship was ready for use again. Grant said his gas was zinc, nitric acid, and an unnamed third chemical. But did he really invent it?[10]

The Journal of the Franklin Institute from December, 1847 has an article discussing that same type of disinfectant as a British invention patented in 1840. There it reports this use in hospitals and also stopping smells in cesspools and such. The ship had been in the hot sun all summer, and reporters noted the smell. Yellow fever, as we now know, is transmitted by mosquitos, not foul air. Probably the bilges had a population of mosquitos and Grant's application of gas both killed them and knocked down the smell and stopped decay so the crew could clean the ship. The newspaper was skeptical itself. The ship went back into periodic service until it was burned at the start of the Civil War. Grant got his name in the paper.[11]

This account shows how Grant actually was hands-on in developing various scientific devices, but he also did a lot to toot his own horn, so to speak. He did not

invent zinc nitrate gas and held no patent for it. Journals and newspaper articles passed back and forth over the Atlantic Ocean much faster than our modern sensibilities might expect, and since he was in that field already, it is not surprising that he would be up to date on recent developments. Later he would be called inventor of the calcium light, which he was not, in a similar manner. The term "Professor" presumably was self-bestowed and foreshadows his rank of "Colonel" during the Civil War, which will be covered later.

The year 1848 does not have much press coverage, but it did see the birth of Grant's second child, Marion, in Baltimore. The family was apparently settled enough that this child is the only one with a record of being christened. Grant continued lighting work and was in the paper again in late 1849.

The North Carolinian newspaper reprinted an article in October 1849 from the *Philidelphia Ledger*.[12] This is significant in that Robert Grant was getting press coverage around the East Coast as "Professor Grant," but more important is that this is the first instance I have found so far in which his device is called a "Calcium Light." This seems to be drawing attention to a new name for a version of a familiar light. The story is about test mounting the light on locomotives to make night travel safe. It "is said to combine the several qualities of both the electric and the Drummond lights." Two weeks later *Scientific American* ran a two-sentence report that the test was successful and the light "threw brilliant rays about half a mile on the track."[13] It is unclear what quality of electric light is meant, as at this time that would have been an arc lamp run by batteries and impractical for a train. Electric spark ignitors for gas street lamps were being developed around then, and perhaps that is what is meant, as otherwise the train would have to stop to fire up the headlight (Fig. 2 shows a similar but later light).[14]

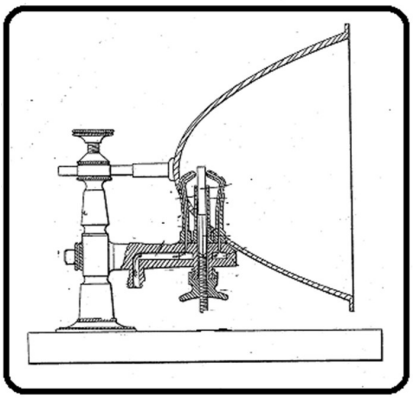


Fig. 2. Drawing of train headlight, US patent 25611. Sept. 27, 1859. May be similar to Grant's.

Now that the word calcium has entered this study, some explanation of terms is needed. In the 1820s, Thomas Drummond experimented with alcohol (spirits of wine) and oxygen to heat the lime, but it was expensive and the oxy-hydrogen blowpipe worked better. The simpler alcohol lamp did not go away though, and by mid-century in England at least was called the oxy-calcium or sometimes just calcium light while the oxy-hydrogen was a limelight or Drummond light. The United States mostly settled on calcium light, even if alcohol was the fuel, and limelight, which was widely used for magic lantern and microscopic projection, as well as theater lighting; the latter use has come down to us as the metaphor "In the limelight."[15]

Limelight and Gas in the 1850s

Robert Grant appears in the 1850 U.S. Census as living in Baltimore, with his wife and two children. Son, John is listed as being born in Maryland in this census. That this is the same Robert Grant is proven by later records that carry through the same family members but more so his area of activity and most telling his occupation as Professor. By early summer he was again lighting up Washington and looking for government contracts.

January 1850 would see Grant in New York City at a gas consumer's meeting, not only talking about calcium street lights, but also a new method of producing the gas.[16] This would be demonstrated in July when he lit the street from the Capitol to the President's house, much like he did in 1846. This time there was better, cheaper oxygen, by his invention, made with nitrate of soda, (and oxide of zinc, which is not mentioned, but had to be part of the chemical process), instead of chlorate of potash and oxide of manganese, and high quality calcium. He claimed the calcium was from a new source and would not break down for forty-eight hours from the action of the gas flame on it and this is where he got the name Calcium Light. A newspaper calls Grant's changes making the oxy-hydrogen blowpipe available for the "use of man." Of course, blow-pipes and various limelights had been around for decades by then.[17]

By August two different U. S. Senators presented petitions for funding. On the ninth, Senator Hunter of Virginia asked that the calcium light be approved for lighting public building and grounds in Washington; the proposal was referred to the Committee on Public Buildings and then to the Committee on Commerce.[18] Then Senator Hamlin, on August 28, read a similar petition, but this one was for testing the calcium light in lighthouses, which also went to the Com-

mittee on Commerce. There is some confusion over what happened with either request for funds.[19] A Washington newspaper printed September 24, 1850 states that $5,000 for Professor Grant's calcium light to be tested in lighthouses was debated and rejected.[20] However, the Statutes at Large of the 31st Congress on September 28 authorized $5,000 for that same thing. Perhaps the testing was debated again or the newspaper confused the two different calcium light issues.[21] Further evidence shows the money actually went to lighthouse work, as Grant's life took almost immediate change in that direction. There is no evidence at this time that Washington buildings or grounds were ever lit with calcium light on a permanent basis.

Robert Grant had now lived in and worked from Baltimore for at least twelve years, but sometime between late 1850 and February 1851, he and his family moved to the New York City area. The U. S. Census taken November 12, 1850 places them in Baltimore still, but the article below has a test in New York in February. Nothing in the papers of Congress indicate where he was to test his lights, but the section of the Statutes authorizing the money is in the midst of several pages of lighthouse disbursements. New York City, Long Island, and New Jersey all got lighthouse work, so it makes sense that he would go there. The fact that his family accompanied him is proven by his second daughter, Josephine, being born in New York on December 25, 1851. Since the first light test was in February, Grant's wife would have had to be with him around that time.

Scientific American for February 15, 1851 covered the test in New York Harbor where the beam of light reached 8.5 miles from Staten Island to Manhattan. The light was placed at Fort Tomkins, probably in the lighthouse itself.[22] Grant's lighting experiments outside used parabolic reflectors only, no lenses, as far as any report found so far has noted. This lighthouse did not have Fresnel lenses installed until 1855, so the test would have been consistent with his earlier public demonstrations.[23] Testing continued until at least the end of 1852. *Scientific American* printed an article calling the test a "perfect success." Navy officers were to give a favorable report to Congress. The cost of $1000 for the machinery, as opposed to $16,000 for a Fresnel lens, was noted, but the story writer did not believe it could be "maintained as cheaply.[24]

It is unknown if the five thousand dollars from Congress went any further, but the experiments and demonstrations continued for many years. Evidence that the money had run out is that Grant was, once again, involved in other jobs. Regardless, Grant lived in the New York City area for the rest of his life.

Fig. 3. New York Crystal Palace designed by Karl Gildemeister. The image is an "oil-color" plate by George Baxter, London, dated 1 September 1853.

Beinecke Library, Yale University.

The Crystal Palace

July 1853 saw the opening of the Exhibition of Industry of All Nations, a world's fair in New York with a Crystal Palace similar to the one at the 1851 Great Exhibition in London (Fig. 3). The exhibition included a 350-foot-tall, mostly wooden tower next to it (Fig. 4). Robert Grant had a display inside of an achromatic oxy-hydrogen microscope, a mega-scope (magic lantern), and an oxy-hydrogen lighthouse lantern.[25] He may have used the same optical devices from the lecture tours of the 1840s. The lighthouse lantern is obviously from the continuing tests and would lead to the tower outside.

The wooden tower, called the Latting Observatory, was the tallest structure in the city at that time with a specially designed platform for the calcium light, which was six feet in diameter and fifteen feet high.[26] Records do not show how often Grant fired up the light, but *Scientific American,* the following year, describes it as casting a shadow like a quarter moon, eleven miles away. That same story also tells of the Northern Board of English Lighthouses declaring their testing to show the light "impracticable in the present state of our knowledge." The British had tested the light of off and on for lighthouses since the late 1820s. Grant responded by saying his new calcium would last twenty-four hours without disintegrating. This is interesting, since he said it would last forty-eight hours just four years before. Perhaps this is why that magazine again took a skeptical view of cost and maintenance.[27]

Fig. 4. Latting Observatory 1853. New York Public Library

Limelight for Ships and Cities

The New York exhibition ran until November 14, 1854, and Grant may have continued experiments and lectures after it closed. In June of 1855 the New York State Census found the family in Brooklyn. They may have just moved there, as the column for years in residence shows 2/12, which may mean two months before the 26th of June, when the census was logged. The family may have been fairly well off by then as they are listed as having a teenaged Irish servant. Grant's profession is "microscope," which points to a living as a lecturer.[28] *Scientific American* wrote that Grant delivered a lecture on January 17, 1856 on the calcium light for lighthouses, so that was still part of his talks.[29]

In April, Grant went in a different direction, supplying a searchlight for a new ship. The ship was a huge, 354 feet long passenger steamship named the *Adriatic*. A Washington newspaper reported that the calcium light was bright enough to see objects a mile in front of the ship. A "novel and valuable feature" was that the cone of light looked like the tail of a comet and would help any other ship in the area avoid collision.[30] This would have extra meaning, as in September 1854, the same company lost one of its ships in a collision at sea with a smaller ship and sank with great loss of life. In January 1856, they lost another ship, as was later found out, when it hit an iceberg. The idea of searchlights on ships seemed a good idea, but it is unknown how many if any lights Grant sold to shipping companies.[31]

By the summer of 1856, an English company developed a magneto powered arc light and sent it to the shipyard in New York to have it tested on the *Adriatic* as well. Grant accepted the challenge from the English and a test was to take place in June. The magneto for this test was a very high-speed flywheel with magnets mounted on the edge.[32] Reliable commercial dynamos would not be available for more than ten years. I have not been able to find the results of the test, but it is worth noting that in 1858, when Queen Victoria visited Napoleon III off the coast of France, her ships used limelight (Fig. 5). The British Royal Navy did not install its first electric arc searchlights until 1876.[33]

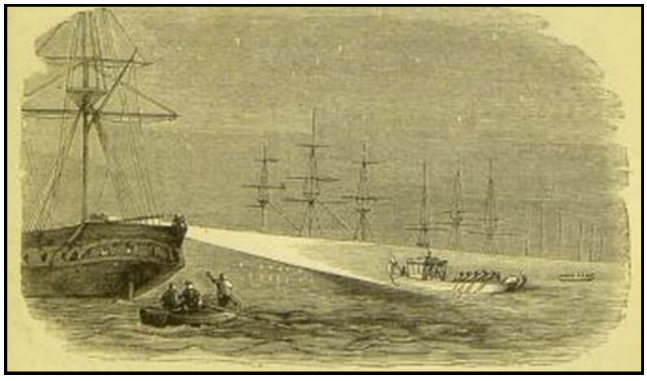


Fig. 5. Queen Victoria's ship lighting with calcium light. John Henry Pepper. 1860. *Boy's Playbook of Science.*

Back in 1842, during the lecture tour, a Charlston newspaper wrote about "improvements in the art of lighting towns and buildings."[34] Grant had demonstrated outside lighting in Washington for years. Now in 1856, an advertisement in the *New York Herald* shows him offering lighting services on a commercial basis. For fifteen dollars one could light up a Ward meeting, twenty-five for a mass meeting, or thirty dollars for a torch-light parade. An engraving in *Harper's Weekly* in November 1860 is captioned "Reading by aid of a Drummond light the returns of the presidential election . . . ." (Fig. 6). Grant is not named, but it can be assumed it was his work, especially when during the 1864 election, he lit up a similar event.

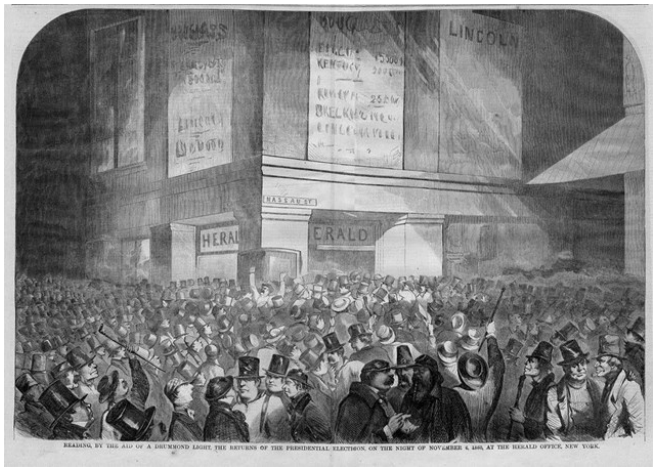


Fig. 6. Reading, by the aid of a Drummond light, the returns of the presidential election on the night of November 4, 1860, at the *Herald* office, New York.

Harper's Weekly (from an Ebay ad).

Robert Grant of Brooklyn got a patent on January 27, 1857 for an improved retort for making hydrogen gas more cheaply by passing it over molten lead or a similar substance to remove excess carbon. It seems the idea was to make gas on site, where it would be used in standard gas fixtures. This is probably an improvement on the system he tried selling to the government back in 1841. A newspaper from January 1859 reprinted an article covering the use of this device in lighting up a church for eighteen cents a night, as opposed to two dollars fifty cents the gas company had charged before. Here it mentions tree bark instead of coal as the hydrogen provider. The article ends by announcing that an agent will be touring Southern cities to sell the invention.[35]

A strange court case was covered in early 1859.[36] The owner of the buildings Grant used was trying to evict him. The case is quite confusing and took up a lot of paper space. The story ended with a jury verdict not known yet, and I have not been able to find what happened, but Grant was still on the property in July when a small boy lit some hay under the shop on fire and ran. Neighbors put it out quickly.[37] It is unknown if this was related to the Court case. The June 18, 1860 U. S. Census lists the family still in the Williamsburg area of Brooklyn. Grant is listed as a calcium light manufacturer. Perhaps it is significant to finances that they no longer have a maid, but this census lists the value of personal estate. Grant's at $2000 is two to six times the amount of anyone else's on that census page, although there is no real estate worth, which could mean the property was still rented.

The Civil War Years

The next year, 1861, the calcium light went to war. The secession crisis was in full swing during January 1861. Even so, normal life went on as well. A January 15th newspaper reported that the recent snowstorm had reduced the number of skaters on the ponds of Central Park and made it so the calcium lights could not be lit. But Professor Grant and his son were still on hand, and the ponds were lit regularly that winter.[38] By May, a shooting war had started, and Lieutenant Quincy Gillmore of the Army Corps of Engineers recommended to the War Department that calcium lights be tested at Fortress Monroe in the Hampton Roads area of Virginia as a way of seeing and firing on enemy ships trying to slip past the Fort (Fig. 7).[39]

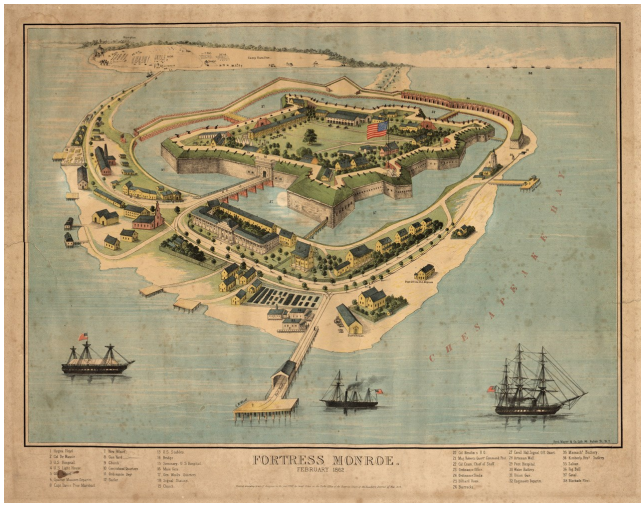


Fig. 7. Fortress Monroe, Virginia, 1862.

University of Michigan Library http://clements.umich.edu/exhibits/online/proclaiming_emancipation/03_Preliminary%20Proclamations/ft_monroe_cropped400.jpg

It is unclear when Grant got the go ahead, but he was at Fortress Monroe by mid-May, when a newspaper carried an article about the light and mentioned that it was like the one shown from the Latting Observatory years before.[40] This was an Ohio paper, which probably reprinted an article form the *New York Daily Tribune*, as a letter to the editor on May 31 took that paper to task for its story of the light.[41] The writer said he had experience, and there was no way the light could perform as written earlier. However, that article simply repeated what had happened in 1854. No one questioned the results then, including *Scientific American*, just the maintenance cost. A few years

ago, a Civil War magazine covered calcium lights, but also took a somewhat dim view, apparently based solely on a two sentence *New York Times* article that reported testing at Ft. Monroe "is a little twisted up with red tape."[42] A more in-depth look finds that *The New York Herald* wrote that on May 25, Grant's light illuminated the distant reaches of Hampton Roads. Even the usually skeptical *Scientific American* carried the story with little comment, and the *Times* itself ran a favorable story on June 1.[43] The "red tape" likely refers to Army bureaucracy, not lighting technical failure. The most telling evidence that testing was successful is that in September, Grant had a contract for lights at Monroe until the following June. It also should be noted that the Confederate Army had no qualms about using similar lights in their harbors. Letters from General Beauregard and others tell of ordering at least ten Drummond lights with an operator from unnamed sources. They received the lights and instructions, but no operator, so got college professor help in putting lights in Charleston, Pensacola, and New Orleans in early 1861.[44]

Meanwhile, after the tests in Virginia, Robert Grant would go on to help form a special Army unit, The Calcium Light Sharpshooters (Fig. 8). There is little information on how Grant got authorization for this, but it is possible General Benjamin Butler, a politician, political appointee General and commander of Fortress Monroe, used some of his influence in Washington after overseeing the lighting tests. Regardless, the regiment was formed in August, 1861.

As the poster in Fig. 8 shows, the Professor is now "Colonel" Grant, but there is no evidence at all that he was ever truly commissioned. The roster does not list him nor did his wife ever apply for a pension after Grant's death.[45] The "Colonel" seems to have been honorary. There is no doubt that Grant was with the Sharpshooters in August and at least some of September, although it must have been as a technical advisor of sorts.[46] The Calcium Light Sharpshooters were recruited to be night fighters. The idea was to confront the enemy by blinding them with a calcium light, which in turn would keep the Federal troops in the darkness so they could shoot at lit targets and not easily come under return fire.[47] The unit was supposed to run a practice on August 26, but had to postpone until the following night because "of an accident with one of the cylinders."[48] This is significant because it proves the gasses were stored in cylinders, not rubber bags.

The demonstration did happen, in New Jersey, and drew such large crowds that special ferries to New York City had to be set up. The test was done by shining the light on a target one-hundred twenty yards away while

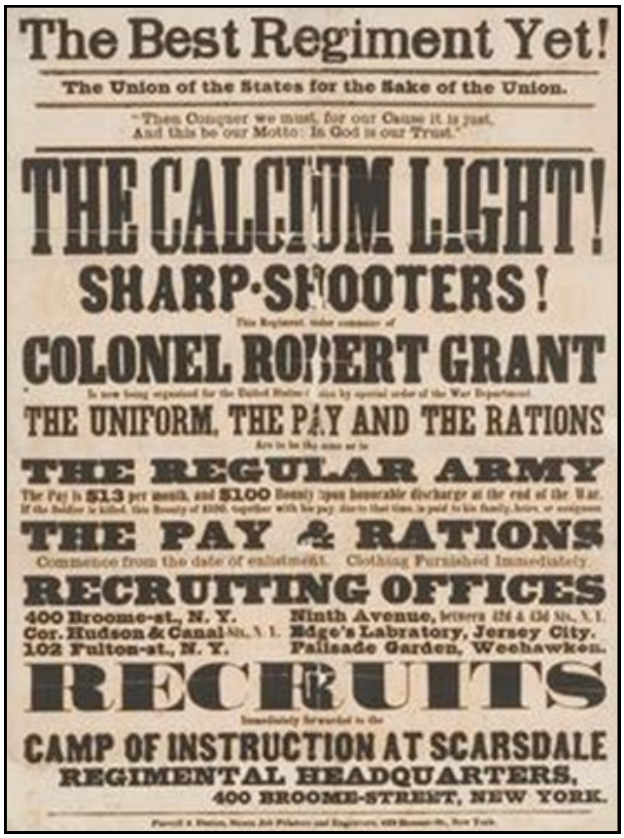

The Best Regiment Yet!
The Union of the States for the Sake of the Union.
"Then Conquer we must, for our Cause it is just,
And this be our Motto: In God is our Trust."
THE CALCIUM LIGHT!
SHARP-SHOOTERS!
COLONEL ROBERT GRANT
THE UNIFORM, THE PAY AND THE RATIONS
THE REGULAR ARMY
THE PAY & RATIONS
Commence from the date of enlistment. Clothing Furnished Immediately.
RECRUITING OFFICES
400 Broome-st., N. Y.
Cor. Hudson & Canal Sts., N. Y.
102 Fulton-st., N. Y.
Ninth Avenue,
Edge's Labratory, Jersey City.
Palisade Garden, Weehawken.
RECRUITS
CAMP OF INSTRUCTION AT SCARSDALE
REGIMENTAL HEADQUARTERS,
400 BROOME-STREET, NEW YORK.

Fig. 8. Recruiting poster for Robert Grant's Calcium Light Sharp-shooters, 1861. Wikipedia

the shooters were off to either side in shadow. The calcium light was in a pit and the beam shown up to a reflector. Not explained is for that to happen there would have to be a reflector on the light as well. The distance is even long in the daytime, but the news article reported several shots hit the target and some were bull's eyes.[49] Although this demonstration was a success, the unit would never go into battle with a calcium light as a guide. In mid-December, the Calcium Light Sharpshooters were "immediately" ordered into The Van Buren Light Infantry and would become Company E of the 102nd Regiment, New York Infantry.[50] The idea tested in New Jersey would finally be used two years later in South Carolina by the Army Engineers.

But what about Colonel Grant? He may have been with the unit until December, when it transferred, since he can't be placed back at Ft. Monroe until January. The 102nd left New York in March 1862 for Washington and they fought in the battles of Northern Virginia, Maryland, and Pennsylvania until September, 1863, when they went to the Western Thea-

ter. There is no evidence they were ever in the same place as Robert Grant for the rest of the war. This shows that Grant was never actually in the Army and instead operated only as a contractor.

Grant's whereabouts from September 1861 to January 1862 are unclear. As covered above he was under contract to the Army beginning in September 28th. The expense reports list $447.93 to Grant and $73.10 to a John McClelland for calcium light apparatus, but no daily fee until January. Most likely these months were spent gathering material and building lights. Grant travelled to and from Monroe an unknown number of times and was paid $135.50 for that. Starting in January, Grant got $4 per day until June 14th and an assistant was paid $2 to $2.25 per day until April 30, when Grant's son John replaced him for $1.50 per day. John Grant may have been carrying on the business in New York until then, as Central Park was still being lit up with calcium lights for thousands of skaters during the season.[51] The total for the contract was $1739.98.[52] This further shows that Robert Grant was a civilian contractor. I have not found any record of what Grant did after June, although he probably returned home to New York until the summer of 1863, when the call to go to Charleston came.

Quincy Gilmore (Fig.9), now commanding general of the campaign around Charleston, South Carolina requested Grant and the calcium light to assist in operations sometime during the summer. Since Gilmore had first suggested the use of lights at Fortress Monroe, it is not surprising he would come to that idea again. It is not known when Grant arrived, but the calcium light was in operation in August and he would have had to set up the gas producing lab which eventually had thirty-two people working in it.

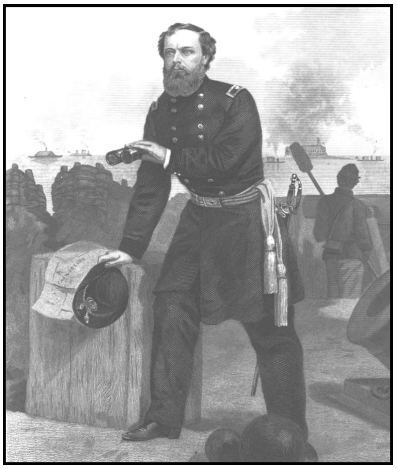


Fig. 9. General Gilmore at Charleston Harbor, 1863.

Wikipedia

Charleston Harbor has several islands around it. The Federal Army landed on Morris Island to attack Forts or Batteries Gregg and Wagner. A frontal assault of Wagner failed in July. This is depicted in the movie *Glory*. After that failure, a siege was begun and that is where the calcium light was most successful in battle. The night of August 10, the calcium light was used against Cummings Point near Fort Gregg, where Confederates landed supplies under cover of darkness. Gilmore wrote that it was only partially successful as the distance of 3000 yards was too much for the light. Confederate General Ripley, on the other hand wrote that "the fire of the enemy interfered seriously with the relief of the troops on Morris Island. . ." because the Drummond light "brightly" illuminated Cummings Point, and they gave up that night.[53]

If the Federal army could disrupt its enemy with calcium lights, the question becomes, why the Confederates didn't do that as well. As noted above, they had at least two lights in Charleston and shining them down on the Federals in front of Fort Wagner would have made it much harder to dig trenches. The probable answer is, no chemicals to make oxygen. The usual way of doing that was to heat a mixture of chlorate of potash and oxide of manganese in a retort, draw off the oxygen, bubble it through a water tank and capture it in large rubber bags. These chemicals had to be very pure or explosions could happen and did according to published accounts from that era.[54] Chlorate of potash was made in the South later in the war, but it went into percussion caps. Manganese was mined in Arkansas, which was mostly cut off from the East in 1863. Therefore, it's unlikely the Confederates would waste much time on making oxygen. Usable hydrogen could have been drawn from the city gas system.

Grant's laboratory must have been making hydrogen with either his retort system or zinc dissolved in sulfuric acid. Back in 1850, he was reported to be using nitrate of soda and oxide of zinc to make oxygen because it made a larger amount, more cheaply. He may have never gotten a patent for it, but in 1861 a British inventor did in England. John Henry Pepper tested it and wrote that The Royal Polytechnic probably would be using that method.[55] Whichever gas producing methods Grant used, the chemicals had to be shipped in by the Navy. The workers were making enough of both gases to fill and pressurize iron cylinders fifteen inches in diameter and eight feet long. That became about 250 cubic feet of gas compressed at about 375 pounds per square inch (psi). With the lights using about 14 cubic feet per hour, the cylinders would have lasted nearly two nights.[56]

After the attack on Fort Wagner failed, a siege began and the 1st New York Volunteer Engineers dug a series of trenches, called saps, back and forth, getting ever closer to the walls of Wagner. Eventually there were five saps in line with Fort walls called parallels and connected to each other. On the left side of the second parallel, a position for probably two calcium lights was made. This was about 750 yards from Wagner and was heavily fortified with gun emplacements and shelters.

As the Federal Army sappers dug closer to Fort Wagner, they were under heavy fire, so mostly worked at night. The Confederates were also under fire all day, but at night were able to repair damage to the Fort. By August 26th the fifth parallel was begun at 250 yards from Wagner and advanced to 100 yards. On September 5th, the calcium lights "brilliantly illuminated every object . . . and brought the minutest detail of the fort in sharp relief." Firing from the fort stopped. Sharpshooters could see to shoot while hidden in darkness. This went on for two nights with heavy Confederate casualties, after which they abandoned Fort Wagner. Calcium lights in battle were successful and the idea of the original Calcium Light Sharpshooters mostly vindicated (Fig. 10).

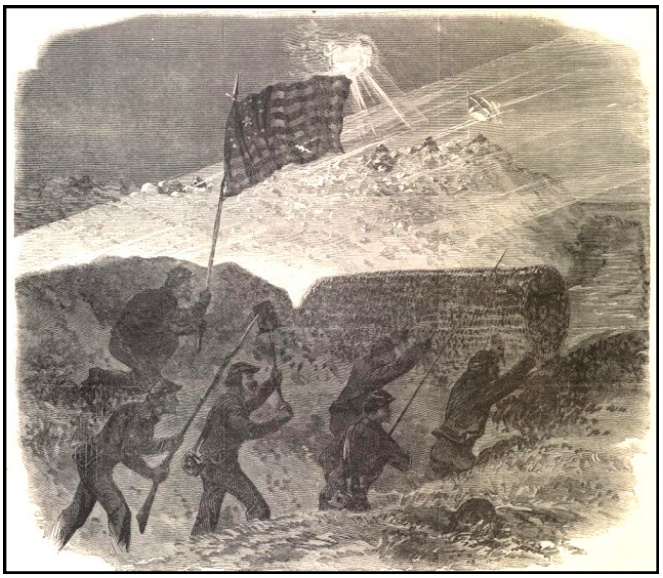


Fig. 10. Sappers push a sap roller, a bundle of wood and iron that provides some protection. The white rays coming from the left are from the calcium light.

Hampton Roads Naval Museum

The lights were used at various times to illuminate targets and harass the Confederates, and they came under fire as well. A *Mechanic's Magazine* story from 1866 reported that the reservoirs (gas cylinders) were hit with shell fragments, which did not put them out of service, but caused dents (see note 56). The siege of Charleston cooled down, but stayed in place into 1865 when the city was evacuated. It is not clear how long Robert Grant was in the area, but by September 1864 he was back in New York City. The Navy began putting calcium lights on new ships and ordered 300. Perhaps Grant built some of them.

There does not seem to be any more direct involvement by Robert Grant in the Civil War. Former General McClellan ran for President against Lincoln in 1864, and Grant lit up a McClellan rally on September 8th with his lights. One of them exploded and killed one woman and probably mortally wounded her sister. Grant testified at the coroner's inquest with quite a bit of technical information. He had been using three gas cylinders: one with oxygen, one with hydrogen street gas run through his patent carbon reducing system, and a large cylinder with a mix of a mix of oxygen and hydrogen. This one exploded. Grant had found the nipple of the blow-pipe bent and touching the lime. He repaired it but apparently it still over-heated. Wire gauze was usually used as a flash arrestor, but he had developed his own design that did stop the problem at the blow-pipe. Grant thought the mixed gasses separated under pressure and the explosion was the result. He stated he would not be mixing the gasses in the cylinders again. It is actually strange that explosions had not happened before. The whole purpose of the blow-pipe and separate containers for each gas is to keep them separate until mixed them just before the flame. The incident was ruled an accident.[57]

The explosion did not put Grant out of business. His September 1865 tax assessment showed, among other things, that he had 4000 cubic feet of illuminating gas on hand. The following year, the New York City directory listed his occupation as "lights," while that year's tax assessment showed 400 cubic feet of oxygen gas with Grant as a manufacturer.[58] The 1866 *Mechanic's Magazine* reprinted and expanded an article from the *Journal of the Franklin Institute* on his Charleston work and that is where the reason for all the gas on hand is explained.

Compressing gas into a metal cylinder had been had been around since 1810, although it is unclear when Grant began using that method.[59] As noted, the Calcium Light Sharpshooters had cylinders, as did the lighting at the Charleston siege lines. *Mechanic's Magazine* went into great detail comparing the usual rubber bag and weight system of gas storage to Grant's cylinders and that he had them for sale. The cylinders were nine inches in diameter and thirty inches tall with thirty cubic feet of gas at 441 psi. The

cost was $30 for the tank, 30 cents per cubic foot to refill with oxygen, and 3 cents per cubic foot for hydrogen. Thus, two cylinders carried by one person replaced twelve rubber bags, pressboards, and six hundred pounds of iron weights.

Epilogue

Robert Grant died on April 13, 1868 and is buried in Cypress Hills Cemetery in Brooklyn. No cause of death is listed, but it can be assumed it was sudden, as there was no will. Jane Grant, his wife, went to court on August 24th to petition that the estate of two hundred dollars be granted to her. It was settled the following day.

Apparently, the son, John Grant, did not carry on the calcium light business. There is a man of that name with the right age and birthplace in the 1870 U. S. census who is listed as a machinist. That would be a reasonable trade to come out of manufacturing the lights. Jane died in 1870 and Josephine moved to an aunt's house in Maine to be a teacher. She has descendants listed on Ancestry.com. Marion has not been found and probably married and changed her name.

Calcium lighting continued on in magic lanterns and theater spots into the twentieth century, mainly called limelight. Even during the Civil War, though, inventors were turning to burning magnesium wire as a light source. The book *Magnesium*, printed in England in early 1865, covers the development of magnesium ribbon wire into lighting only a year before. Photographers immediately began using it. One section suggested if the wire had come out a few years earlier, the Northern blockade of Southern ports would have been much more effective. The book went on to report that the Washington Government had ordered a large supply of wire for the Navy.[60]

The real replacement for calcium lighting was electric arc lighting. In the late 1860s commercial dynamos producing reliable electricity became available. Arc lights also improved, and with Charles Brush's auto-adjusting system in 1878, cities began the long switch to electric lighting of the streets. Some of Brush's arc lights went into street light fixtures similar to the existing gas lamps. Most were mounted in towers high over the city streets to light a wide area. That use for the calcium light, tested nearly forty years before by Robert Grant in Washington and New York, was gone forever, but the idea had finally proven itself.

Notes and References

Census reports, tax rolls, death certificates, and probate records were accessed through Ancestry.com or familysearch.org.

City directories are through the New York Public Library Digital Collections.

Newspaper articles are from The Library of Congress, Chronicling America search engine or public domain internet posts.

Scientific American magazine archives were searched through a subscribed service.

Google books continues to an excellent resource for long out of print books. Those used are cited below. Figures are in the public domain or meet fair use criteria.

Patents were found in the *Subject-Matter Index of the Patents for Inventions Issued by the United States Patent Office from 1790 to 1873, Inclusive (*Google Books). Patent write-ups and drawings were found through Google Advanced Patent search engine.

Congressional records were accessed through the Library of Congress, American Memory project.

Thanks to Sarah Waitz, Archivist of the Center for Legislative Archives, National Archives and Records Administration. Without her timely, above and beyond help, some of this information would not have been found.

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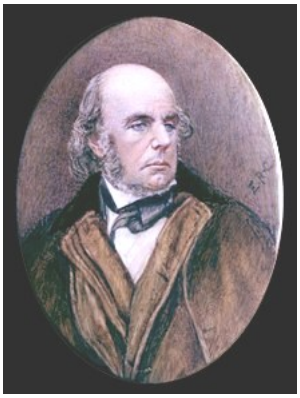
The Research Page presents summaries of recent academic research on topics related to the magic lantern. For a comprehensive bibliography of research articles, see:
https://www.zotero.org/groups/magic_lantern_research_group

Karin Littau. 2018. Translation and optical media: spirit-channeling in Edward FitzGerald's *Rubáiyát of Omar Khayyám*. *Amodern* 8. http://amodern.net/article/translation-optical-media/

Many scholars of Victorian literature have explored the influence of contemporary optical media, including magic lanterns, on the writings of 19th century authors such as Lewis Carroll and Charles Dickens. In this article, the author examines the way in which references to optical media were incorporated into Edward FitzGerald's "free translation" of the *Rubáiyát of Omar Khayyám,* an immensely popular work in the Victorian era and beyond. FitzGerald actually first translated the 11th century poet's work from Persian into Latin, and then from Latin into English, and he also retranslated parts of the work several times for successive editions. Littau argues from other writings that FitzGerald was deeply interested in magic lanterns, dissolving views, the phantasmagoria, peepshows, and other optical media, all of which find their way into his translation as visual metaphors. She cites many convincing examples of phrases that clear seem to reference magic lantern practice, also pointing out that previous scholars often have missed this connection. For example, the lines "We are no other than a moving row/Of visionary shapes that come and go" is said by the author to "literally refer to lantern-projected phantoms." A previous scholar, on the other hand, interpreted these lines as an allegory of reading. While such language most likely would have been interpreted by Victorian readers as refering to the magic lantern, an 11th century Persian poet would not have known of this instrument, although he could have been influenced by optical media of the time, such as shadow puppets and shadow plays. Overall, this article provides interesting new insights into the role of optical media in 19th century literature.

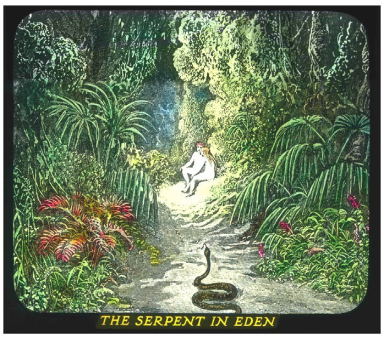


Edward FitzGerald (1809-1883).

Wikipedia

Sarah C. Schaefer. 2017. Illuminating the Divine: the magic lantern and religious pedagogy in the USA, ca. 1870-1920. *Material Religion* 13:275-300.

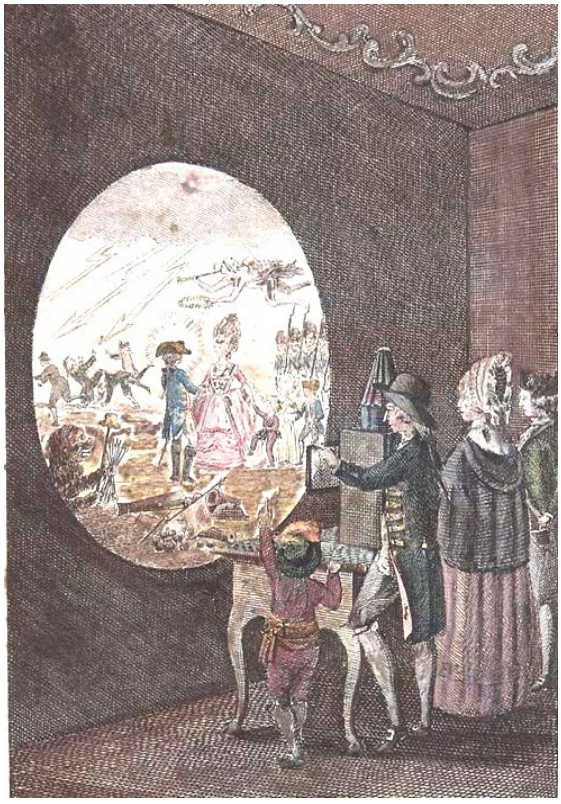
This interesting article explores the use of the magic lantern for American religious teaching in the late 19th and early 20th centuries. During this period, the production and distribution of religious magic lantern slides was a huge industry in the United States, led by the C. W. Briggs Company of Philadelphia, which supplied slides to dealers throughout the country. Schaefer's research draws heavily on the archives of the Briggs Company, now housed at the George Eastman Museum in Rochester NY. Her focus is less on individual clergymen and lecturers than on the general practices of these exhibitors, the content of their lectures, and the subject matter of the slides used to illustrate them. The main part of the article begins with a short history of the magic lantern, most of which will be familiar to readers of the *Gazette*. Several pages are devoted to a discussion of the Briggs Company and its role in the lantern slide industry, including its association with lantern slide illustrator Joseph Boggs Beale. There is an extensive discussion of *The Photo-Drama of Creation*, an early 20th century extravaganza combining lantern slides, moving pictures, and recorded sound that was seen by millions of people. One interesting feature of the *Photo-Drama* is the use of lantern slide images spanning almost a century by different artists and manufacturers. For example, the author illustrates some astronomical slides used in the *Photo-Drama*, some of them mechanical motion slides, that are essentially identical to those used by lecturers such as Dionysius Lardner in the 1840s. The author then extends her discussion from the *Photo-Drama* to a more general treatment of the screen practices and types of slides and scripts used by church pastors and religious lectures in venues from town halls to Chautauqua tents. The article adds substantially to an under-researched topic in American magic lantern history.



The Garden of Eden, from *The Photo-Drama of Creation.*

Ivo Nieuwenhuis. 2017. Schadenfreude and slander in the Age of Revolution: the case of the Dutch journal *Lanterne Magique of Toverlantaern* (1782-1783). *Journal of European Periodical Studies* 2.2:94-112. https://ojs.ugent.be/jeps.

This article provides a detailed analysis of an 18th century satirical journal called *Magic Lantern* (in two languages), which belongs to a genre of political literature that uses cruel and often crude language to mock and humiliate political opponents. In this case, the writers supported the Dutch House of Orange, while the targets were members of the Patriot Movement opposed to the Orangists. The use of the imagery of the magic lantern show or a raree show (peep show) was common in political pamphlets and broadsheets of the period. In the case of *Lanterne Magique*, individual slanders against particular opponents, some several pages long, were collected into a journal, with each piece representing the description of a lantern slide. The narrator was the showman, who interspersed crude insults against the intended target with exclamations about how funny the slide is. Although the imaginary slides were not illustrated, there was a frontispiece illustrating a magic lantern show revealing the cowardice of the Patriots. The article provides interesting insights into the cultural history of the magic lantern.



Frontispiece of *Lanterne Magique*.

Victorian dissolving view of a man dreaming by the fireside. Successive views of his past life would appear when the dissolving views were projected. Wells collection.

Anne Sullivan. 2017. Animating flames: recovering fire-gazing as a moving-image technology. *19: Interdisciplinary Studies in the Long Nineteenth Century* 25 (https://doi.org/10.16995/ntn.792).

This article is one of several in a special feature on technologies of fire in 19th century British culture in an open-access online journal. The author defines fire-gazing as involving "a solitary viewer who perceives animated, moving images dissolving into and out of view in a wood or coal fire. The flames may suggest arbitrary pictures, reveal fantastic landscapes, or trace more familiar forms, such as the faces of friends and family." This also brings to mind a common genre of magic lantern dissolving views in which a person is not literally gazing at a fire, but dreaming beside one. This article focuses mainly on literary references to fire-gazing, many of which invoke magic lantern imagery. There are many references to magic lanterns, from the sort of dissolving views mentioned above to Pepper's Ghost shows at the Royal Polytechnic. The author focuses particularly on Charles Dickens, who had an affinity for magic lantern shows, dissolving views, and fire-gazing reveries. She also points out that the theme of fire-gazing carried over into early motion pictures. In a 1908 silent film directed by Edwin S. Porter and J. Searle Dawley, entitled *Fireside Reminiscences*, there is a scene similar to the dissolving view shown above, in which a man sits by a fire and views a succession of memories from his past life. Presumably audiences for this film were familiar with such imagery from both dissolving views and literary descriptions.

Above: Commemorative medal of Latting Observatory, built next to the New York Crystal Palace in 1853. At the time it was the tallest structure in New York and served as a platform for Robert Grant to exhibit his powerful calcium light, with which he illuminated a large area of the city. David McLean tells the story of Grant's career with the calcium light, which extended beyond its use with a magic lantern. http://numismatics.org/collection/0000.999.8215

Front cover: Postcard of a majic lantern covered with Spring violets. This card also was sold with greetings such as Merry Christmas, Happy New Year, and Happy Easter. Wells collection